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ABSTRACT

The role played by nonstatistical procedures, in contrast to multivariant statistical approaches, in analyzing faculty salaries is discussed. Multivariant statistical methods are usually used to establish or defend against prima facia cases of gender and ethnic discrimination with respect to faculty salaries. These techniques are not applicable, however, when the number of individuals is small or when it is necessary to draw conclusions concerning a single individual. The problem then becomes one of conducting an impartial investigation of a claim made by a single individual assigned to a rather small department. The technique of counterparting, or cohort analysis, can be used to show evidence of salary or promotion discrimination (or its absence) within a unit as small as a department. The idea behind counterparting in salary studies is that, for each individual to be studied, the researcher selects a group of people who are identical to that person with respect to all the commonly available characteristics that affect salary, except for the single characteristic on which the discrimination claim is based. Factors affecting faculty salaries are discussed, along with events that cause a salary change to occur. A hypothetical example of a salary case is included. (SW)

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ANALYZING FACULTY SALARIES WHEN STATISTICS FAIL

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ABSTRACT

The use of multivariant statistics in analyzing faculty salaries is a well documented research method. Such methods are usually used to establish or defend against prima facia cases of gender and ethnic discrimination with respect to faculty salaries. These techniques are not applicable, however, when the number of individuals is small or when one wishes to draw conclusions with regard to a single individual. The problem then becomes one of conducting an impartial investigation of a claim made by a a single individual assigned to a rather small department. The standard technique that one is referred to is known variously as peer pairing, counterparting, or cohort analysis. The inference that one usually draws from the reference is that the process of cohort analysis is too well known and trivial to bear further discussion. The purpose of this paper is to show that, contrary to this view, a rigorous cohort analysis focused on a question of discrimination is far from trivial and takes the researcher deep into the structure of faculty salaries. The major point made in this paper is that it is not proper to hold the selected cohort fixed but, rather the cohort should be allowed to vary over time as the claimant progresses through the academic ranks.

In the process of demonstrating the complexity of cohort analysis this report suggests various methods of surmounting common problems.

Analyzing Faculty Salaries When Statistics Fail

Introduction

Although the literature related to faculty salary analysis in the last ten years is extensive, a remarkably large portion of it is devoted to the single theme of investigating gender or ethnic discrimination at the institutional level. Consequently, nearly all of the papers involve the use of various multivariant statistical techniques--usually regression analysis but occasionally other methods such as discriminant, factor, or canonical analysis; only rarely have researchers studied the structure of faculty salaries (Tuckman, Hamovitch, Katz, Smart) and even here, statistical tools have been used and the emphasis has been placed on determining a monetary value for various faculty accomplishments. The heavy reliance on standard statistical techniques which is reflected within this body of research, results in the practitioner being quickly left to his/her own devices as soon as the problem to be studied dictates against the use of statistical methods. This situation arises once the issue becomes one of investigating the salary of one person or even a small group of faculty. For example, it frequently happens that when a group of faculty bring a class action suit against their institution and fail to adequately prove that a gender or ethnic bias pervades the entire institution, the plaintiffs then lodge individual claims of discrimination within their departments. This change in tactics forces a researcher engaged in supporting either side of the claim to abandon the well established statistical procedures, which are designed to handle many variables and hundreds of cases, and conduct an investigation involving perhaps only a handful of people.

The purpose of this paper is primarily one of showing how evidence of salary or promotion discrimination (or its absence) can be detected within a

unit as small as a department without using statistics. In the course of outlining this method, it is necessary to dissect the faculty salary structure and examine its component parts--a secondary result that may prove to be of equal interest, by providing a better understanding of the many details that confound a researcher who expects to find that faculty salaries are based upon an obvious, rational framework.

The Technique of Counterparting

Many of the papers dealing with the more global problem of using statistical methods of detecting discrimination within a large group of faculty contain an aside statement which cautions the reader not to use regression techniques to study small groups of faculty or to measure the degree of discrimination exerted against a particular individual. Usually this caveat is followed by a recommendation that, in these cases, the researcher should use the idea of "counterparting." ("peer pairing," or "cohort studies" are terms also assigned to the same general idea.) Thus the less experienced reader is left wondering whether this method of "counterparting" is yet another sophisticated mathematical technique, which is too complex to explain in any short paper, or whether it is such an elementary procedure, that no discussion is needed. The actual status of counterparting lies somewhere between these two extremes but, surprisingly, it is rather more complex than many of us may believe.

The idea behind counterparting in salary studies is that, for each individual to be studied, the researcher selects a group of people who are identical to that person with respect to all the commonly available characteristics which affect salary except for the single characteristic upon which the discrimination claim is based (e.g., race or gender). The researcher then compares the salaries of the group members to that of the individual to see if they differ

to any significant degree. If there is a serious salary differential, the study is continued by searching for other explanatory variables that are missing from the analysis up to that point. Frequently, the missing variable is "quality" or "merit." The problem then becomes one of deciding how to measure quality and then locating historical records of such measures. Such a study is often concluded with a judgment as to whether the existing salary differential is more likely due to considerations of quality rather than a result of discrimination.

The phenomena that complicates this relatively simple idea of counterparting is that the comparison group (cohort) assigned to an individual usually changes over time or with respect to the type of salary change under investigation, a fact which is seldom recognized and which necessitates a more detailed analysis. Much of what follows was developed from efforts to cope with this change in the composition of the cohort as salaries are tracked over time.

The Faculty Salary Structure

Within nearly all institutions, faculty salaries are determined by a relatively unregulated, decentralized process that frequently results in a wide spectrum of salaries for people who, on the surface, appear to possess quite similar characteristics. To select several individuals who entered the system together and to inquire as to why their salaries are not the same ten years later is to ask an extremely complex question.

Many factors affect a faculty member's salary, the most influential of which are:

academic discipline
rank
merit
seniority
administrative assignments
timing
competitive bids from other institutions

A faculty member's discipline is an important determinant of salary. As long as the market for engineers is more competitive than for philosophers, salaries will reflect this difference. Likewise, rank, merit, and seniority should be expected to enter into any salary adjustment process.

In many institutions, the magnitude of an administrative salary supplement is individually negotiated; in other institutions, the supplement is uniform. Likewise, policies differ on what happens when the administrative post is relinquished. Even where very regularized policies are observed, the monetary value of an administrative post becomes obscure when the encumbent is recruited from outside the institution; for example, a new department chairmen, recruited from another institution can frequently negotiate a higher permanent salary than would be typically given to a successful internal candidate. For these reasons, faculty with previous administrative assignments must be closely examined before deciding to include them in any salary study.

The element of timing is somewhat subtle. An assistant professor of business who enters the university when the student enrollments have created a high demand for such faculty may enter with a far higher salary than did the senior people in the department who perhaps entered when interest in business was at a low ebb. As a result, the new professor narrows the gap between his salary and those salaries reflecting a difference of 20 years of academic service. Further, one person may be lucky enough to gain a rank promotion during a year when extra funds were available and thereby gain considerably over his near peer who is promoted the next year when only a small promotion increment was possible. The task of separating the unfortunate effects of timing from those effects ensuing from illegal discrimination is extremely difficult.

Frequently a faculty member will be granted a salary increase to match a bid from another institution. When such an increment is incorporated with the regular annual raise, there results an anomaly which will prove puzzling to people reviewing the salaries years later, without any knowledge of the outside job offer. In effect, such an increase to fend off a competitive bid may be viewed as a cross-product of the individual's merit and the market value of his discipline. In some departments, such raises have been so prevalent that any attempt to find a rational basis for salaries is nearly impossible. This condition points up the importance of records kept at the department level.

In the light of these many factors which can influence a faculty member's salary, the problem of tracking the salary history of several individuals over a period of years becomes rather daunting. If, however, one notes that salaries do not change continuously over time but rather at distinct points, the complexity of the task is greatly diminished. Consider the discrete events that cause a salary change to occur:

- entry into the institution
- annual raises
- promotion raises
- status changes (administrative, 9-month vs 12-month appointment)
- raises to counter outside job offers

Discrimination can be exercised at any or all of these points, but is far more likely to occur at one of the first three, with raises due to status changes or counter-offers being viewed as complicating elements that need to be removed from the data before any comparisons are made. Thus if the researcher compares a specified individual's salary to the salaries of an appropriate cohort at the time of entry, annual raises, and promotion, any signs of a systematic bias should be apparent. How such a study might be conducted is best shown by way of a concrete but hypothetical example.

Hypothetical Example

A researcher is asked to investigate the claim that the salaries of the two female faculty members (Smith, Jones) in the Social Science Department have been subjected to a discriminatory bias over the past ten years. Since each of the women entered at different times and now hold different ranks, they must each be studied separately rather than considered as a group. If a gender bias has in fact been exerted, the researcher would expect to find similar signs of bias within each of their salary histories.

The first phase of the analysis is to examine the equity of entry salaries. Since rank and salaries are both related and subject to the same type of biases, the question we seek to answer is, "Did female faculty members receive an entry rank and salary comparable to males entering with the same credentials and at the same time?" The critical step is the selection of the proper counterpart group for each female. Since the women entered the university at different times and, in this case, with different credentials, they will each be assigned a different male cohort from which to determine the adequacy of their entry salary. Ideally, the entry counterpart group would contain only faculty entering the same year; however, for small departments such a restrictive criterion could well result in too small an entry cohort. Thus, in this example we shall also include in a given female's cohort all faculty who entered the institutions one year before or after her. Table 1 exhibits the results for this phase. The researcher first ensures that all the women were appointed to the same rank as similarly qualified men. Further, one would expect to find that less qualified men (i.e., without a Ph.D.) were appointed at a lesser salary and perhaps a lower rank. Finally, the analyst should ensure that each women's initial salary was comparable to salaries of her male peers. Here the measure of "comparability" is a judgment; exactness is

unlikely. Note that in Table 1 the impulse to calculate an average salary for the comparison cohorts was resisted. It is often better to view the individual cases and allow the mind to form a judgment of whether equity was achieved. Only in cases of very large cohorts should averages or medians be resorted to. Since entry salaries tend to rise with inflation, in cases where the cohort spans entries over several years, the analyst should at least mentally reduce the latest entry salaries to adjust for such inflation. If such mental gymnastics become irksome the consumer's price index could be used to quickly adjust each salary.

In constructing Table 1, the researcher needs to be alert to such obvious details as to whether people are appointed to 12- or 9-month positions and to appropriately prorate salaries. In instances where certain salaries stand out as obvious anomalies, the researcher should suspect extenuating circumstances and examine the records for such evidence. In the case at hand, the entry salary indicated by "*" was given to a young faculty member who had 5 years experience as a chairperson in a very small college. In this case, the analyst should eliminate that person from the cohort. It is preferable that such "purifications" of the cohort should take place during the initial selection process rather than after the first table is constructed as these late refinements could be viewed by a critic as attempts to skew the data to a more favorable conclusion.

An examination of the Smith cohort in Table 1 shows that the entry level rank and salary appears to be fairly uniform. The only feature that calls for further inquiry is the nine month appointment given to the only female member. Assuming that the $6400 salary for the nine months is appropriately scaled in relation to the other salaries, the only question to settle is whether Smith requested the nine month appointment or whether it was simply given to her. In

the latter case, one would consider this to be evidence of a bias exerted at the entry level. It is worth noting that if Smith's salary was simply compared to the cohort average salary prorated to nine months, as is commonly done, no suggestion of a gender bias with respect to type of appointment would emerge.

A similar examination of the Jones cohort reveals an obvious indication of a bias with regards to salary level for her level of entry. Further investigation may disclose mitigating circumstances but at this first stage a prima facia case for discrimination exists.

The second phase of the study consists of a review of annual raises awarded over the 1970 to 1980 period. The construction of the appropriate counterpart group depends upon the institution's raise policy. If the raises were dependent upon rank, then each woman's cohort would consist of all males holding the same rank as she for each raise period; this principle would probably result in a different cohort each year as faculty members are promoted into and out of the cohort over the 10 year period. If, however, the average faculty raise has no relationship to rank, being either uniformly distributed over all ranks. or based solely on merit, then the cohort for both women would be the same and consist of all the men in the department regardless of rank. For a fuller explication, we assume in our example that the more complicated, former situation prevails in our example. Table 2 illustrates one way this data could be presented. For simplicity, we consider the cohort for only one woman--Professor Smith. A given male faculty member's raise is recorded for only those years in which that person falls within the cohort associated with Professor Smith--i.e., when he is at the same rank as she. Table 2 poses the greatest potential problem in interpretation because here the question of "merit" is the most pronounced. It is obvious that the faculty members display varying degrees of merit each year. If raises reflect that merit, one expects

to see a historical trend line that fluctuates widely. Here the question to be answered is, "Do the raises for the women appear to generally fall within the lower percentile?" If the answer to the above is affirmative, the investigation must be expanded to include a search of departmental records for evidences of relative merit. Unless existing records or testimony can support the presumption that higher raises to men were reflective of greater merit, then an assumption of a gender bias may stand.

Note in Table 2 that certain raises are superscripted with a "P." This is used to mark those raises that represent both an annual and a promotion in rank increase. The analyst should largely ignore these consolidated raises unless the annual raise can be separated from the promotion component.

In the particular example illustrated in Table 2, the raises awarded to Prof. Smith do not appear to be biased. The relative position of Smith's raises within the cohort certainly varies from year to year but this is to be expected under a merit raise system. The point to note is that her raises are not constantly within the lower register of raises awarded across the cohort. Of course, she could be an outstanding individual who has been discriminated against by the award of "average" merit raises, but such subtle distinctions go far beyond any data analysis. In the context of establishing a prima facia case of gender bias, Table 2 provides no such evidence with respect to Prof. Smith. Before leaving this table, one should note the radical changes in the composition of the cohort each year. Until the rank of full professor is reached, people are moving into and out of the cohort with each year's promotions.

The concluding phase of the study examines the question of rank promotion. Did the women receive promotional pay increases that were comparable to those of their male peers, and did they serve a comparable number of years in each rank before promotion? In many institutions, there is no policy governing how

large a raise should be given for a promotion in rank. In these instances the raise is often dependent upon the funds available the year of the promotion. Similarly, the number of years served at each rank may well vary over the years in reflection of policy, the opinion of the encumbent chairperson, or the nature of the recruiting market. Thus the cohorts for this phase should consist only of those males who were promoted the same year as the female faculty member. In small departments, it may again be necessary to enlarge this cohort by adding promotions within one year of the base year as has been done in Table 3 and 4.

Tables 3 and 4 display the promotional raises and the time in rank, respectively. Once again, we look only for a general pattern, keeping in mind that merit necessitates considerable variation. In these constructed examples, it appears that Smith received an equitable pay raise for each of her two promotions but Table 4 suggests that she spent an unusually long time in the associate professor rank. Further evidence should be gathered to clarify whether or not this delay is justified.

Conclusion

The primary purpose of this paper has been to counterbalance the predominance of statistical papers on faculty salaries with at least one exposition of the role played by nonstatistical procedures. In those cases where the number of faculty involved are so small that the methods of multivariant analysis do not apply, the method of counterparting must be used. Because counterparting is not mathematical, we tend to regard it as being almost too elementary for explanation. In this paper I have attempted to show that the use of counterparting in analyzing faculty salaries is far from simple and that the complexity arises from the need to construct different cohorts for each question under

consideration and, in some cases, for each year of the time period. A study, therefore, necessitates a very well developed understanding of how faculty salaries change in response to policy, market conditions, and traditions.

As legal cases involving discrimination gradually shift from those involving entire institutions in class action suits to suits related to specific individuals in single departments, we can expect to see a parallel shift from papers dealing with multivarient analysis to those suggesting new ways to conduct counterparting studies.

Table 1

Entry Salaries for Faculty Appointed into the Tenure System during the 1965-69 Period within the Department of Social Science

	Type Appt. in Mos.	Individual	Sex	Entry Date	Without Ph.D. Rank	Without Ph.D. Salary	With Ph.D Rank	With Ph.D Salary
	12		M	1965			Assistant Professor	$10,000
	12		M	1965	Instructor	$ 7,120		
	12		M	1965	Instructor	8,500		
Smith Cohort	9	Smith	F	1966	Instructor	6,400		
	12		M	1967	Instructor	8,500		
	12		M	1967	Instructor	10,000*		
	9		M	1972			Assistant Professor	8,200
	9		M	1972			Assistant Professor	9,000
	9		M	1972			Assistant Professor	8,500
	9		M	1973	Instructor	7,500		
	9		M	1973			Assistant Professor	10,500
	9		M	1973	Instructor	7,900		
Jones Cohort	9	Jones	F	1973			Assistant Professor	7,800
	9		M	1973			Assistant Professor	10,200
	9		M	1974			Assistant Professor	9,000
	9		M	1974			Assistant Professor	8,300
	9		M	1974			Assistant Professor	8,200
	9		M	1974			Assistant Professor	9,500
	9		M	1974			Assistant Professor	12,500

isfcsl

Table 2

Department of Social Science

Percent Salary Raise Awarded as of Fall Term

Individual	Sex	Asst. Prof.			Assoc. Prof.			Full Professor								
		68	69	70	71	72	73	74	75	76	77	78	79	80	81	83
Smith	F	5.9	7.8	9.3	9.0[P]	8.5	4.1	10.9[P]	6.8	7.7	6.0	7.3	7.0	8.2	10.1	4.3
	M	5.3	6.1		6.7	8.0	5.0									
	M			9.1			4.4		9.8[P]	9.2	9.0	10.3	10.9	9.5	10.0	5.2
	M	5.0	7.0	8.0				6.9	6.5	6.6	6.8	7.5	7.2	9.7	11.0	4.9
	M		7.5	9.0				7.5	5.5	5.5	7.0	7.0	7.0	8.9	10.1	4.0
	M							5.9	3.0	5.5	7.0	7.0	5.9	7.5		
	M							6.0	2.1							
	M											4.4	5.9	8.9	10.0	4.5
	M			10.0		14.9[P]	5.5				8.6[P]	7.2	7.0	8.0	6.7	
	M										6.4	7.2	8.1	8.0	9.1	5.0
	M								6.4	8.4	9.1	7.2	7.0	8.5	6.5	
	M				6.3								7.1	7.5	5.5	4.2

isfcs1

Table 3

Comparison of Promotional Raises
in the Social Science Department

Individual	Sex	Salary Raises for Promotion from: Assistant Professor to Associate in: 70	71	72	73	74	Associate Professor to Professor in: 75	76	77	78	79
Smith	F		$1,100 10.4%						$1,800 10.9%		
	M			$1,900 14.9%							
	M						$1,000 6.5%				
	M									$2,150 9.8%	
	M			$ 850 5.5%							
	M	$2,300 18.4%									
	M				$1,100 7.7%						
	M			$1,100 8.2%							
	M			$ 800 6.2%							
	M	$1,600 11.1%								$2,300 10.8%	
	M				$1,000 7.5%						
	M				$1,000 7.7%						
	M		$1,000 8.1%								
							$ 900 5.9%				
	M		$1,000 7.5%								
	M		$1,000 7.3%								
	M				$ 850 6.4%						
	M			$ 800 5.4%							
	M	$1,500 12.4%									

Table 4

Comparison of Time in Rank before Promotions
in the Department of Social Science

Individual	Sex	Years in Lower Rank at the time of Promotion to: Associate Professor 70	71	72	Professor 74	75	76	77	78
Smith	F		5					6	
	M		5			4			
	M		6				5		
	M		7				5		
	M		4		3				
	M		4			4			
	M		5				5		
	M	4				5			
	M	5				5			
	M			5				5	
	M			6					6
	M			6				5	